

WRAP MACHINE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U. S. Provisional Application No. 60/423,514, filed on November 4, 2002, the entire contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] Wrapping machines have been developed for wrapping plastic film around items on a pallet to retain the items for shipping and the like. Known wrapping machines include a film dispenser mounted on an arm to rotate about the pallet and thereby wrap the items on the pallet. The film dispenser may also be mounted for vertical travel such that the film is wrapped around the items in a spiral manner. Other known wrapping machines include a rotary table upon which the pallet is placed. In this type of machine, the wrapping device is mounted to a stationary vertical structure. During the wrapping process, the table and pallet thereon are rotated, and the wrapping device travels vertically to thereby spiral wrap the items on the pallet. Known wrapping machines include a gripper that grips the end of the film to thereby tension the film as it is fed from the film dispenser. Known grippers are pneumatically powered, and therefore require a supply of compressed air in addition to the electrical power that is required to operate the other components of the wrapping machine. The need for a supply of compressed air to operate the gripper often results in extra expense and/or inconvenience, particularly in facilities that do not already have a supply of compressed air.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Fig. 1 is perspective view of a wrap machine according to one aspect of the present invention;

[0004] Fig. 2 is a right front view of the wrap machine of Fig. 1;

[0005] Fig. 3 is a left front view of the wrap machine of Fig. 1;

[0006] Fig. 4 is a rear view of the wrap machine of Fig. 1;

[0007] Fig. 5 is a top view of a gripper for wrap machines according to the present invention, with the gripper being in an open position;

[0008] Fig. 6 is a top view of the gripper wrap machines according to the present invention, with the gripper being in an open position;

[0009] Fig. 7 is a perspective view of the electrically powered rack and pinion mechanism and gripping members;

[0010] Fig. 8 is a partially schematic perspective view of another wrapping machine according to another aspect of the present invention, wherein the grippers are mounted to a rotary table.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] For purposes of description herein, the terms "upper," "lower," "right," "left," "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the invention as orientated in Fig. 1. However, it is to be understood that the invention may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting.

[0012] The reference number 10 (Fig. 1) generally designates a wrap machine of the present invention. The wrap machine 10 includes a frame 12, a rotating arm 14 having a stretch wrapping device 16 thereon and a gripper housing 18. The frame 12 includes a substantially C-shaped base 20, a vertical frame member 22, an upper horizontal frame member 24 and a pair of struts 26 extending between the base 20 and the upper horizontal frame member 24. The frame 12 further includes a cantilevered arm 28 extending from the upper horizontal frame member 24. The rotating arm 14 is connected to the cantilevered arm 28. The rotating arm 14 has an inverted L-shape, with an end of the horizontal portion rotatably connected to the end 29 of the cantilevered arm 28. A first electric motor and drive assembly 15 rotates arm 14 360° about the end of cantilevered arm 28. The stretch wrapping device 16 is operably coupled to a second electric motor and drive assembly 19, and moves up and down the vertical portion of the rotating arm 14 to wrap a film web about a plurality of items placed on a pallet, which is placed within a wrapping area 17 defined by the C-shaped base 20 of the frame 12. The stretch wrapping device 16 (Fig. 3) includes a web dispenser 30 which supports a roll 32 of conventional film web 34, and prestretch rollers which stretch the film web 34 before it is

dispensed from the web dispenser 30 over the items on the pallet. In the illustrated example, the rotating arm 14 further includes a wipe and burn mechanism 45 for burning the film web 34 once the items on the pallet have been wrapped and for wiping a free end of the film web 34 after it has been burnt into contact with the rest of the film web 34 on the items on the pallet. All of the elements discussed above, except the gripper housing 18, are conventional items and are well known to those skilled in the art.

[0013] In the illustrated example, the gripper housing 18 is spaced away from the C-shaped base 20 of the frame 12. As illustrated in Figs. 1-4, the stretch wrapping device 16 is configured to rotate in a space 21 located between the gripper housing 18 and the C-shaped base 20. The gripper housing 18 preferably includes a pair of gripping members 50 extending from a top surface 23. As discussed in more detail below, the gripping members 50 are electrically activated, with the electricity being conducted to the gripper housing 18 by a 24 volt ribbon wire 52 that has a low profile. The ribbon wire 52 extends between the C-shaped base 20 of the frame 12 and the gripper housing 18. The frame 12 includes a conventional electrical connection for providing power to all parts of the wrap machine 10.

[0014] Preferably, the gripping members 50 are connected to a rack and pinion system 55 (Fig. 7) that moves the gripping members 50 from an open position as shown in Fig. 5 to a closed position as shown in Fig. 6. An electrically powered linear actuator 57 includes an output shaft or member 58 that shifts horizontally upon actuation of linear actuator 57. The output member 58 extends through an opening in an angle bracket 61, and angle bracket 61 is fixed to rack 56. Angle bracket 61 is positioned between stop members 59 and 60 of the output member 58 such that stops 59 and 60 contact bracket 61 and shift rack 56 horizontally upon actuation of linear actuator 57. Rack 56 extends through a guide 64 and teeth 63 of rack 56 engage a gear 65 to rotate a first gripper member 50A. A pair of gears 66 and 67 mesh to thereby cause gripper member 50B to rotate in an opposite direction relative to gripper 50A. When the output shaft 58 is in the extended position as illustrated in Fig. 7, gripper members 50A and 50B are rotated to the open position. As output member 58 is retracted, a spring 62 contacts the vertical wall 68 of angle bracket 61, thereby pulling the rack 56 towards the actuator 57 and rotating the gripper members 50A and 50B to the closed position. The spring 62 thereby provides a relatively constant, controlled force acting on the film between the

gripper members 50A and 50B, and reduces or eliminates the variations in force that would otherwise occur due to varying thicknesses of the film and/or variations in the amount of travel of output member 58 of actuator 57. Other resilient members or arrangements providing a constant gripping force could also be utilized. For example, rubber or foam could be positioned on the edges of the gripper members 50A and/or 50B. The linear electrically powered actuator 57 is secured to a base member 71 by an actuator bracket 70, and gripping members 50A and 50B are rotatably mounted in brackets 69. The gripper housing 18 is preferably bolted into position on the ground by fasteners 73 or other suitable anchoring arrangements.

[0015] In use, the wrap machine 10 is used by placing the pallet full (or partially full) of items within the area defined by the C-shaped base 20 of the frame 12 and with a circle defined by the rotation of the vertical portion of the rotating arm 14, with the pallet abutting the gripper housing 18. To begin, a free end of the film web 34 is clamped by the gripping members 50. Once the pallet is in position, the rotating arm 14 begins to rotate, thereby wrapping the pallet and the items on the pallet with the film web 34. With the wrap machine 10 of the present invention, the lowest portion of the stretch wrapping device 16 can get very close to the ground because the stretch wrapping device only has to clear the ribbon wire 52 in the lowest portion of rotation. Therefore, the pallet does not have to be raised off of the ground and/or the gripping members 50 do not have to be located in the ground to be able to wrap the pallet. Previously, the pallet was placed on a platform and/or the gripping members 50 were located in the ground to be able to wrap the pallet. Additionally, the gripper housing 18 has a height of about 3 to 3.25 inches, thereby allowing the film web 34 to be wrapped about the pallet without the gripper housing 18 interfering.

[0016] As the stretch wrapping device 16 spins about the items on the pallet, moving vertically to wrap the all of the items, the gripping members 50 can release the free end of the film web 34. Thereafter, when all of the items on the pallet have been wrapped, the rotating arm 14 can move back to an initial position that the rotating arm 14 was in before the wrap sequence begun. Thereafter, the gripping members 50 can once again be activated to grab the film web 34 between the items on the pallet and the stretch wrapping device 16. The wipe and burn mechanism 45 will then move into contact with the film web 34 between the items on the pallet

and the stretch wrapping device 16 to burn the film web 34 to thereby sever the film 34 and to wipe a free end of the film web 34 extending from the items on the pallet into contact with the film web 34 about the items on the pallet. The pallet can then be removed and another pallet can be placed into position to start the process over again to wrap items on the second pallet with the film web 34.

[0017] The gripper housing 18 and grippers 50A and 50B may also be utilized for a rotary table wrapping machine 80. The gripper mechanism of Fig. 7 and housing 18 are mounted to a rotary table 82 adjacent an edge of table 82, and thereby rotates as table 82 is rotated. A stretch wrapping device 16 dispenses a film web in a known matter, and travels vertically along vertical structure 81 of wrapping machine 80. A conventional wipe and burn mechanism 45 is also provided. Electric drive assemblies 84, 85 of a conventional known design provide for vertical movement of the stretch wrapping device 16 and for rotary movement of rotary table 82. The housing 18 is mounted on upper surface 83 of rotary table 82 and thereby provides a stop to position pallets or other items on table 82. A conventional slip ring arrangement or the like provides electrical power from the main power supply source to the linear electric actuator mounted to the rotary table 82. In use, a pallet is placed on rotary table 82, and an end portion of the film web is secured by grippers 50A and 50B upon actuation of linear actuator 57. Table 82 is then rotated, and stretch wrapping device 16 moves vertically to thereby wrap the items on rotary table 82.

[0018] The above description is considered that of the preferred embodiment only. Modification of the invention will occur to those skilled in the art and to those who make or use the invention. Therefore, it is understood that the embodiment shown in the drawings and described above is merely for illustrative purposes and not intended to limit the scope of the invention.